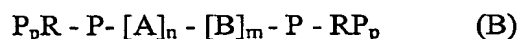
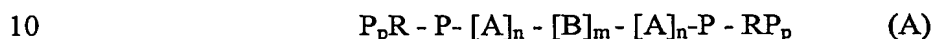


Claims

1. A process for the removal of multivalent metal cations from an aqueous system, wherein said aqueous system is treated with a high molecular weight non-ionic surfactant comprising anionic groups or salts thereof, preferably terminal anionic groups and salts thereof, wherein said high molecular weight non-ionic surfactant comprising anionic groups or salts thereof is represented by formula A or formula B:



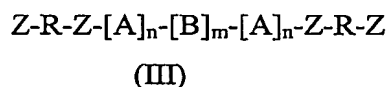
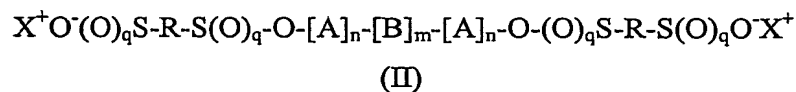
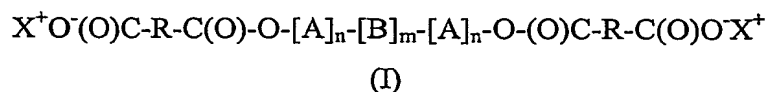
wherein:

- 15 P is a mono-valent oxygen containing anionic group or a salt thereof selected from the group consisting of oxides of carbon, sulphur and phosphorus;
 p is in the range of 1 to 4;
 R is a linear or branched, saturated or unsaturated C₂ - C₁₂ alkylene group;
 A is ethylene oxide;
 20 B is propylene oxide;
 n is in the range of 5 to 1000; and
 m is in the range of 5 to 1000.
2. The process according to Claim 1, wherein the oxides of carbon, sulphur and phosphorus are selected from:

- 25 -C(O)O⁻X⁺;
 -S(O)_q-O⁻X⁺ wherein q is 1 or 2;
 -P(O)(O⁻X⁺)₂;
 -P(O)(H)-O⁻X⁺;
 30 =P(O)-O⁻X⁺; and
 =P-O⁻X⁺

wherein X is independently selected from hydrogen, an alkali metal, an ammonium group NR'_4^+ wherein R' is independently selected from hydrogen or linear or branched $\text{C}_1\text{-C}_4$ alkyl groups, or two X's are an alkaline earth metal.

3. The process according to Claim 1 or Claim 2, wherein the groups P are terminal mono-valent oxygen containing anionic groups or salts thereof.
4. The process according to Claim 3, said surfactant being characterised by the following general formula (I) or (II) or (III):



wherein:

X is hydrogen or an alkali metal, preferably lithium, sodium or potassium, or an ammonium group NR'_4^+ wherein R' is independently selected from hydrogen or linear or branched $\text{C}_1\text{-C}_4$ alkyl groups, or two X's are an alkaline earth metal, preferably magnesium or calcium;

R is a linear or branched, saturated or unsaturated $\text{C}_2 - \text{C}_{12}$ alkylene group;

A is ethylene oxide;

B is propylene oxide;

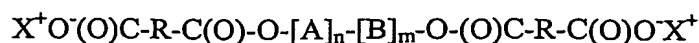
n is in the range of 5 to 1000;

m is in the range of 5 to 1000;

q is 1 or 2; and

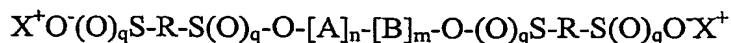
wherein Z is independently selected from phosphonate or phosphinate.

5. The process according to claim 3, said surfactant being characterised by the following general formula (IV) or (V) or (VI):



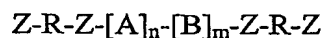
20

(V)



(VI)

5



(VII)

wherein:

10 X is hydrogen or an alkali metal, preferably lithium, sodium or potassium, or an ammonium group NR'_4^+ wherein R' is independently selected from hydrogen or linear or branched C_1 - C_4 alkyl groups, or two X's are an alkaline earth metal, preferably magnesium or calcium;

R is a linear or branched, saturated or unsaturated C_2 - C_{12} alkylene group;

15 A is ethylene oxide;

B is propylene oxide;

n is in the range of 5 to 1000;

m is in the range of 5 to 1000;

q is 1 or 2; and

20 wherein Z is independently selected from phosphonate or phosphinate.

6. The process according to Claim 4 or Claim 5, wherein X is hydrogen or an alkali metal, preferably sodium or potassium.
7. The process according to any one of Claims 4 - 6, wherein R is a linear and saturated C_2 - C_6 alkylene group.
- 25 8. The process according to Claim 7, wherein R is ethylene.
9. The process according to any one of the preceding Claims, wherein n is in the range of 10 to 100.
10. The process according to any one of the preceding Claims, wherein m is in the range of 10 to 100.
- 30 11. The process according to any one of Claims 1 - 10, wherein said process comprises decreasing the hardness of said aqueous system
12. The process according to any one of claims 1 - 11, wherein said process comprises an industrial or a domestic wash process.

13. The process according to any one of Claims 1 – 12, wherein the temperature of said aqueous system is 0 - 200°C.
14. A process for the removal of multivalent metal cations from an aqueous system, wherein said multivalent metal cations are contacted at a first temperature with
5 and thermo-reversibly bonded to a high molecular weight non-ionic surfactant comprising anionic groups or salts thereof, preferably terminal end groups or salts thereof to form a cation-surfactant complex, and wherein said cation-surfactant complex is subjected to a second temperature, the second temperature being
10 lower than the first temperature, to release said multivalent metal cations from said high molecular weight non-ionic surfactant comprising anionic groups or salts thereof, preferably terminal anionic groups or salts thereof.